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1 Methodology for simulation application to virtual manufacturing environments ▩
◈ Tracey L. Geller, Suzanne E. Lammers, Gerald T. Mackulak
December 1995 **Proceedings of the 27th conference on Winter simulation**
Publisher: ACM Press
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2 Virtual reality for manufacturing simulation ▩
◈ Karen C. Jones, Marc W. Cygnus, Richard L. Storch, Kenneth D. Farnsworth
December 1993 **Proceedings of the 25th conference on Winter simulation**
Publisher: ACM Press
Full text available: 📄 pdf(645.67 KB)   Additional Information: full citation, references

3 Manufacturing applications: Best modeling methods: virtual factory: highly interactive visualisation for manufacturing ▩
Wolfgang Mueller-Wittig, Reginald Jegathese, Meehae Song, Jochen Quick, Haibin Wang, Yongmin Zhong
December 2002 **Proceedings of the 34th conference on Winter simulation: exploring new frontiers**
Publisher: Winter Simulation Conference
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> Funded by the Agency for Science, Technology and Research - A*STAR - Singapore, CAMTech is collaborating with a Singaporean research institute and two industry partners with the objective to improve electronics assembly processes. The goal of this project is to visualise the behaviour of an electronics assembly industry based on discrete events simulation. The traditional scenario - from the customer placing order for a product to delivery - goes through various phases including manufacturing ...

4   Simulation-based scheduling: Supply chain planning: rolling horizon scheduling of multi-factory supply chains

Eunkyoung G. Cho, Kristin A. Thoney, Thom J. Hodgson, Russell E. King

December 2003   **Proceedings of the 35th conference on Winter simulation: driving innovation**

Publisher: Winter Simulation Conference

Full text available: pdf(404.64 KB)   Additional Information: full citation, abstract, references

The Virtual Factory is a job shop scheduling tool that was developed at NC State. It has been found to provide nearoptimal solutions to industrial-sized problems in seconds. Recently, the Virtual Factory was expanded to include interfactory transportation operations which enabled the detailed scheduling of entire multi-factory manufacturing supply chains. Separately, a rolling horizon procedure was developed to test the Virtual Factory for single factory problems. This procedure allowed us to ...

5   Animation: Building a virtual factory

Jochen Manfred Quick, Chao Zhu, Haibin Wang, Meehae Song, Wolfgang Müller-Wittig

June 2004   **Proceedings of the 2nd international conference on Computer graphics and interactive techniques in Australasia and South East Asia GRAPHITE '04**

Publisher: ACM Press

Full text available: pdf(332.18 KB)   Additional Information: full citation, abstract, references, index terms

In this paper, we describe a visualisation system which helps simulation experts transform discrete simulation models and results into animated scenes in a virtual environment. The system aims to significantly reduce production costs and error sources during the generation process of visualisations. The means to achieve these goals are the development of a framework for the translation of simulation results into animations, reuse of animation elements, and the implementation of customization too ...

Keywords: animation, simulation, virtual factory, visualisation

6   Modeling methodology a: Virtual worlds: experiencing virtual factories of the future

Anthony P. Waller, John Ladbrook

December 2002   **Proceedings of the 34th conference on Winter simulation: exploring new frontiers**

Publisher: Winter Simulation Conference

Full text available: pdf(709.17 KB)   Additional Information: full citation, abstract

This paper explains the latest project work being undertaken at the Ford Motor Company in the generation of simulation models from spreadsheet interfaces and in particular the latest advances in the automatic creation of virtual reality worlds based on these model layouts. The ease of creation is the key to the use of the third dimension but being able to visualise a facility more accurately overcomes obstacles to understanding and discussion. The paper explains the technical process involved ...

7   Agents, interactions, mobility and systems: Agent factory: generative migration of mobile agents in heterogeneous environments
F. M. T. Brazier, B. J. Overeinder, M. van Steen, N. J. E. Wijngaards
March 2002   **Proceedings of the 2002 ACM symposium on Applied computing**
Publisher: ACM Press
Full text available: pdf(522.21 KB)   Additional Information: full citation, abstract, references, citings, index terms

> In most of today's agent systems migration of agents requires homogeneity in the programming language and/or agent platform in which an agent has been designed. In this paper an approach is presented with which heterogeneity is possible: agents can migrate between non-identical platforms, and need not be written in the same language. Instead of migrating the "code" (including data and state) of an agent, a blueprint of an agent's functionality and its state is transferred. An agent factory gener ...

> **Keywords:** compositional design, mobile agents, process migration

8   Applications in logistics, transportation, and distribution: Manufacturing supply chain applications: modeling computer assembly operations for supply chain integration
Sanjay Jain, Ngai Fong Choong, William Lee
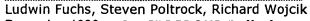December 2002   **Proceedings of the 34th conference on Winter simulation: exploring new frontiers**
Publisher: Winter Simulation Conference
Full text available: pdf(634.78 KB)   Additional Information: full citation, abstract, references, citings

> Factory operations have been modeled for years to understand the relationship between the different design and policy factors and the performance measures of interest. The increasing awareness of the need to manage factories as a link in the supply chain places a corresponding requirement for an enhanced approach for factory modeling. This paper describes the modeling of a computer assembly factory for supply chain integration by including aspects of inbound and outbound logistics and relevan ...

9   Business value of 3d virtual environments
Ludwin Fuchs, Steven Poltrock, Richard Wojcik
December 1998   **ACM SIGGROUP Bulletin**, Volume 19 Issue 3
Publisher: ACM Press
Full text available: pdf(600.51 KB)   Additional Information: full citation, abstract, citings, index terms

> As a large geographically distributed company, Boeing needs integrated technologies that support, even encourage, working together across distances. As a foundation for working together, employees need to become acquainted with one another, form communities around shared interests, develop relationships, build trust, and communicate. Social networks are important within Boeing; people use these networks to find and fill openings in projects and programs. Project teams will more readily span geog ...

10   Simulation in the next millennium
Sanjay Jain
December 1999   **Proceedings of the 31st conference on Winter simulation: Simulation---a bridge to the future - Volume 2**

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11 <u>Virtual organization and electronic commerce</u>
Bob Travica
August 2005 **ACM SIGMIS Database**, Volume 36 Issue 3
Publisher: ACM Press
Full text available: pdf(380.58 KB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>index terms</u>

The purpose of this article is to contribute to understanding the virtual organization and its relationship with electronic commerce. The relevant literature on virtual organization forms through which business-to-business e-commerce is organized is reviewed. A model of the virtual organization is presented and its use in a case study demonstrated. Implications for further research are discussed.

Keywords: electronic commerce, virtual alliance, virtual corporation, virtual interorganizational team, virtual organization

12 <u>Simulation education: Perspectives on simulation in education and training: virtual environments for the training of maintenance and service tasks</u>
Eberhard Bluemel, Axel Hintze, Torsten Schulz, Marco Schumann, Stefan Stuering
December 2003 **Proceedings of the 35th conference on Winter simulation: driving innovation**
Publisher: Winter Simulation Conference
Full text available: pdf(442.84 KB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>

This paper presents an interactive, virtual reality based training environment specifically developed to support training of maintenance procedures of complex technical equipment. The architecture of the system will briefly be described. Moreover, the paper explains the different training modes that allow for adapting the training environment to the trainee's knowledge and determine the level of interactivity. A short glimpse is given to the scenario author's work. Finally, an example scenari ...

13 <u>Simulation-based scheduling: Scheduling & control: rolling horizon scheduling in large job shops</u>
Kristin A. Thoney, Jeffrey A. Joines, Padmanabhan Manninagarajan, Thom J. Hodgson
December 2002 **Proceedings of the 34th conference on Winter simulation: exploring new frontiers**
Publisher: Winter Simulation Conference
Full text available: pdf(201.35 KB)   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>citings</u>

The Virtual Factory is a job shop scheduling tool that was developed at NC State. It has been shown to provide near-optimal solutions to industrial-sized problems in seconds through comparison to a computed lower bound. It is an iterative simulation-based procedure, whose objective is minimizing maximum lateness. Like many other job shop scheduling tools, the Virtual Factory has been evaluated primarily in a transient setting, even though a rolling horizon setting is

more indicative of the si ...

14 A game experience in every application: Making virtual environments compelling
Mary C. Whitton
July 2003 **Communications of the ACM**, Volume 46 Issue 7
Publisher: ACM Press
Full text available: pdf(238.41 KB) html(26.46 KB)   Additional Information: full citation, abstract, references, index terms, review

Delivering a compelling user experience and ensuring application success both depend on the fidelity of the user's sensory immersion.

15 Animation planning for virtual characters cooperation
Claudia Esteves, Gustavo Arechavaleta, Julien Pettré, Jean-Paul Laumond
April 2006 **ACM Transactions on Graphics (TOG)**, Volume 25 Issue 2
Publisher: ACM Press
Full text available: pdf(597.60 KB)   Additional Information: full citation, abstract, references, index terms

This paper presents an approach to automatically compute animations for virtual (human-like and robot) characters cooperating to move bulky objects in cluttered environments. The main challenge is to deal with 3D collision avoidance while preserving the believability of the agent's behaviors. To accomplish the coordinated task, a geometric and kinematic decoupling of the system is proposed. This decomposition enables us to plan a collision-free path for a reduced system, then to animate locomoti ...

Keywords: Autonomous characters, behavior modeling, motion control, motion planning

16 Intelligent software technology for the new decade
Alexander S. Narin'yani
June 1991 **Communications of the ACM**, Volume 34 Issue 6
Publisher: ACM Press
Full text available: pdf(916.94 KB)   Additional Information: full citation, abstract, references, index terms, review

Our collective has been working in the AI domain for more than 15 years. During most of that period our research focused on two "classical" subjects: 1. natural language interfaces and 2. knowledge representation and processing. From the early 1980s, in addition to working on the conceptual aspects of AI, we have been increasingly involved in developing advanced technology of intelligent systems. Participating in the START project [1] stimulated our research and development [R&a ...

17 Augmented reality for manufacturing planning
F. Doil, W. Schreiber, T. Alt, C. Patron
May 2003 **Proceedings of the workshop on Virtual environments 2003 EGVE '03**
Publisher: ACM Press
Full text available: pdf(4.45 MB)   Additional Information: full citation, abstract, references, citings, index terms

The shortening of development cycles demand for efficient methods and tools for the planning of complex production systems. Recently immersive Virtual Reality technologies have been introduced to the manufacturing planning functions. This has lead to a decrease in planning times as well as to the improvement of the quality of planning results. The introduction of various virtual planning tools is targeting the complete integration of all planning tasks and demands an intuitive interaction with c ...

Keywords: augmented reality, manufacturing planning, visualization

18 Virtual reality—what will it do to you?: the future of work and play for computer graphics professionals
Mary K. Javener
November 1994 **ACM SIGGRAPH Computer Graphics**, Volume 28 Issue 4
Publisher: ACM Press
Full text available: pdf(307.75 KB)   Additional Information: full citation, index terms

19 Symmetric and asymmetric action integration during cooperative object manipulation in virtual environments
Roy A. Ruddle, Justin C. D. Savage, Dylan M. Jones
December 2002 **ACM Transactions on Computer-Human Interaction (TOCHI)**, Volume 9 Issue 4
Publisher: ACM Press
Full text available: pdf(1.03 MB)   Additional Information: full citation, abstract, references, citings, index terms

Cooperation between multiple users in a virtual environment (VE) can take place at one of three levels. These are defined as where users can perceive each other (Level 1), individually change the scene (Level 2), or simultaneously act on and manipulate the same object (Level 3). Despite representing the highest level of cooperation, multiuser object manipulation has rarely been studied. This paper describes a behavioral experiment in which the *piano movers' problem* (maneuvering a large ob ...

Keywords: Virtual environments, object manipulation, piano movers' problem, rules of interaction

20 Foundations of electronic commerce: computer science at work
Neal G. Shaw
October 1997 **Crossroads**, Volume 4 Issue 1
Publisher: ACM Press
Full text available: html(47.09 KB)   Additional Information: full citation, references, citings, index terms

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1 Virtual reality for manufacturing simulation   ▦

Karen C. Jones, Marc W. Cygnus, Richard L. Storch, Kenneth D. Farnsworth
December 1993 **Proceedings of the 25th conference on Winter simulation**
Publisher: ACM Press

Full text available: 📄 pdf(645.67 KB)   Additional Information: full citation, references

2 Augmented reality for manufacturing planning   ▦

F. Doil, W. Schreiber, T. Alt, C. Patron
May 2003 **Proceedings of the workshop on Virtual environments 2003 EGVE '03**
Publisher: ACM Press

Full text available: 📄 pdf(4.45 MB)   Additional Information: full citation, abstract, references, citings, index terms

The shortening of development cycles demand for efficient methods and tools for the planning of complex production systems. Recently immersive Virtual Reality technologies have been introduced to the manufacturing planning functions. This has lead to a decrease in planning times as well as to the improvement of the quality of planning results. The introduction of various virtual planning tools is targeting the complete integration of all planning tasks and demands an intuitive interaction with c ...

Keywords: augmented reality, manufacturing planning, visualization

3 Manufacturing applications: Decision making using simulation: solving   ▦
     sequential decision-making problems under virtual reality simulation system

Yang Xianglong, Feng Yuncheng, Li Tao, Wang Fei
December 2001 **Proceedings of the 33nd conference on Winter simulation**
Publisher: IEEE Computer Society

Full text available: 📄 pdf(297.51 KB)   Additional Information: full citation, abstract, references, index terms

A large class of problems of sequential decision-making can be modeled as Markov or Semi-Markov Decision Problems, which can be solved by classical methods of dynamic programming. However, the computational complexity of the classical MDP algorithms, such as value iteration and policy iteration, is prohibitive and will grow intractably with the size of problems. Furthermore, they require for each action the one step transition probability and reward matrices, which is often unrealistic to obtain ...

4 Interactive, agent based, modeling and simulation of virtual manufacturing assemblies
Yi Yan, S. Ramaswamy
April 1998 **Proceedings of the 36th annual Southeast regional conference**
Publisher: ACM Press
Full text available: pdf(1.83 MB)   Additional Information: full citation, references, index terms

5 Applications: AR-planning tool: designing flexible manufacturing systems with augmented reality
J. Gausemeier, J. Fruend, C. Matysczok
May 2002 **Proceedings of the workshop on Virtual environments 2002 EGVE '02**
Publisher: Eurographics Association
Full text available: pdf(3.06 MB)   Additional Information: full citation, abstract, references

The technology of augmented reality (AR), as a new user interface, introduces a completely new perspective for the design of technical manufacturing systems. This technique supports a face to face collaboration where users need to be able to easily cooperate with each other. As with typical construction sets like LEGO or Fischertechnik, the planning engineers model the future manufacturing system in their real environment. The components are taken from virtual construction sets and are positione ...

Keywords: AR, augmented reality, construction set, manufacturing planning, user interface

6 Virtual reality and simulation
Martin Barnes
November 1996 **Proceedings of the 28th conference on Winter simulation**
Publisher: ACM Press
Full text available: pdf(993.23 KB)   Additional Information: full citation, references

7 Manufacturing applications: Manufacturing modeling methods: virtual reality simulation of a mechanical assembly production line
Deogratias Kibira, Chuck McLean
December 2002 **Proceedings of the 34th conference on Winter simulation: exploring new frontiers**
Publisher: Winter Simulation Conference
Full text available: pdf(416.71 KB)   Additional Information: full citation, abstract, references, citings

This paper presents our work on the application of virtual-reality simulation to the design of a production line for a mechanically-assembled product. The development of this simulation was undertaken as a part of the Manufacturing Simulation and Visualization Program at the National Institute of Standards and Technology in Gaithersburg, MD. The major research problem is the partitioning and analysis of the assembly operation of the prototype product into different tasks and allocation of the ...

8   Manufacturing applications: A virtual environment for simulating manufacturing operations in 3D

Ravi Chawla, Amarnath Banerjee

December 2001   **Proceedings of the 33nd conference on Winter simulation**

Publisher: IEEE Computer Society

Full text available: pdf(337.90 KB)   Additional Information: full citation, abstract, references, index terms

This paper presents a method for simulating basic manufacturing operations (unload, load, process, move, and store) in a 3D virtual environment. The virtual environment provides a framework for representing a facility layout in 3D, which encapsulates the static and the dynamic behavior of the manufacturing system. The 3D manufacturing objects in the facility are mapped with the nodes in the framework. The framework, a modified scenegraph structure, is a tree structure, which can be manipulated b ...

9   Virtual reality and simulation: an overview

Robert Macredie, Simon J. E. Taylor, Xiaoning Yu, Richard Keeble

November 1996   **Proceedings of the 28th conference on Winter simulation**

Publisher: ACM Press

Full text available: pdf(553.55 KB)   Additional Information: full citation, references

10   Simulation of Real-Time Systems: An Object-Oriented Approach Supported by a Virtual Reality- Based Tool

Tereza Goncalves Kirner, Claudio Kirner

April 2005   **Proceedings of the 38th annual Symposium on Simulation ANSS '05**

Publisher: IEEE Computer Society

Full text available: pdf(139.30 KB)   Additional Information: full citation, abstract, index terms

This article intends to demonstrate the applicability and usefulness of Virtual Reality (VR) technology to support Real-Time Systems (RTS) simulations, as a form to evaluate the correctness of such systems. The Virtual Reality SIMulation (VR-SIM), a tool which incorporates VR modeling resources, is presented. This tool offers support to simulate the behavior of RTS, checking the scheduling of processes and timing constraints. The main conceps of RTS, simulation and VR are presented, the VR-SIM a ...

11   Augmented reality / 3D modeling: A framework for rapid evaluation of prototypes with augmented reality

Selim Balcisoy, Marcelo Kallmann, Pascal Fua, Daniel Thalmann

October 2000   **Proceedings of the ACM symposium on Virtual reality software and technology**

Publisher: ACM Press

Full text available: 📄 pdf(1.80 MB)   Additional Information: full citation, abstract, references, citings

In this paper we present a new framework in Augmented Reality context for rapid evaluation of prototypes before manufacture. The design of such prototypes is a time consuming process, leading t o the need of previous evaluation in realistic interactive environments. We have extended the definition of modelling object geometry with modelling object behaviour being able to evaluate them in a mixed environment. Such enhancements allow the development of tools and methods to test object behaviour, a ...

Keywords: Augmented Reality, Human Factors, Object Behaviour, Prototyping, Virtua Humans

12 Simulation modeling with artificial reality technology (SMART): an integration of virtual reality and simulation modeling

Hank Grant, Chuen-Ki Lai
December 1998 **Proceedings of the 30th conference on Winter simulation**

Publisher: IEEE Computer Society Press

Full text available: 📄 pdf(203.58 KB)   Additional Information: full citation, references, index terms

13 New techniques for presenting instructions and transcripts: Comparative effectiveness of augmented reality in object assembly

Arthur Tang, Charles Owen, Frank Biocca, Weimin Mou
April 2003 **Proceedings of the SIGCHI conference on Human factors in computing systems**

Publisher: ACM Press

Full text available: 📄 pdf(237.22 KB)   Additional Information: full citation, abstract, references, citings, index terms

Although there has been much speculation about the potential of Augmented Reality (AR), there are very few empirical studies about its effectiveness. This paper describes an experiment that tested the relative effectiveness of AR instructions in an assembly task. Task information was displayed in user's field of view and registered with the workspace as 3D objects to explicitly demonstrate the exact execution of a procedure step. Three instructional media were compared with the AR system: a prin ...

Keywords: augmented reality, computer assisted instruction, human computer interaction, usability study

14 Experiences with virtual reality applications (panel)

William R. Sherman, Nina Adams, Rita Addison, R. Bowen Loftin, Ben Britton, Donna Cox, Robert Patterson
August 1997 **Proceedings of the 24th annual conference on Computer graphics and interactive techniques**

Publisher: ACM Press/Addison-Wesley Publishing Co.

Full text available: 📄 pdf(1.32 MB)   Additional Information: full citation

15 Manufacturing applications: Best modeling methods: virtual factory: highly interactive visualisation for manufacturing

Wolfgang Mueller-Wittig, Reginald Jegathese, Meehae Song, Jochen Quick, Haibin

Wang, Yongmin Zhong

December 2002 **Proceedings of the 34th conference on Winter simulation: exploring new frontiers**

Publisher: Winter Simulation Conference

Full text available: 📄 pdf(367.28 KB)   Additional Information: full citation, abstract, references

Funded by the Agency for Science, Technology and Research - A*STAR - Singapore, CAMTech is collaborating with a Singaporean research institute and two industry partners with the objective to improve electronics assembly processes. The goal of this project is to visualise the behaviour of an electronics assembly industry based on discrete events simulation. The traditional scenario - from the customer placing order for a product to delivery - goes through various phases including manufacturing ...

16 Session F7: VR hand manipulation and haptics: Virtual assembly operations with grasp and verbal interaction

W. Zhao, V. Madhavan

June 2006 **Proceedings of the 2006 ACM international conference on Virtual reality continuum and its applications VRCIA '06**

Publisher: ACM Press

Full text available: 📄 pdf(430.46 KB)   Additional Information: full citation, abstract, references, index terms

This paper presents an immersive virtual reality environment (IVE) for performing assembly and maintenance simulations using the Jack® software package. The Flock of Birds™ motion tracking system is used to capture body postures of an immersed human and reproduce it in real-time in the virtual environment. The Cyberglove™ is used to capture finger movements in real-time for realistic grasp interaction. A comprehensive set of voice commands has been developed to provide significan ...

Keywords: assembly, grasp, verbal interaction, virtual reality

17 Session S2: VR applications: Hierarchical visualization of metabolic networks using virtual reality

Yuting Yang, Eve Syrkin Wurtele, Carolina Cruz-Neira, Julie A. Dickerson

June 2006 **Proceedings of the 2006 ACM international conference on Virtual reality continuum and its applications VRCIA '06**

Publisher: ACM Press

Full text available: 📄 pdf(235.31 KB)   Additional Information: full citation, abstract, references, index terms

MetNetVR combines graph layouts in 3D space, computer graphics, and VR technologies for interactive visualization of high dimensional metabolic networks. This paper highlights the use of hierarchical visualization that captures the hierarchical relationships in metabolic networks and the use of detail-on-demand interactions to help users understand both the global relationships and local details of a large network simultaneously. Complex interactions are enabled by MetNetVR Tweek, an auxiliary 2 ...

Keywords: computer graphics rendering, graph layout, interactive visualization, metabolic network, virtual reality

18 <u>Military applications: Military keynote: military-based virtual systems</u>
<u>engineering</u>
Kenneth Mark Bryden
December 2002 **Proceedings of the 34th conference on Winter simulation:**
exploring new frontiers
Publisher: Winter Simulation Conference
Full text available: <u>pdf(139.86</u>
<u>KB)</u>   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>

This paper discusses how the military can and should move into the world of
virtual systems engineering. In the past engineering designs were first done on
paper, reviewed using scale models, and finalized in the full scale products. In
the future all aspects of product design, manufacture, and repair will be done in
virtual space. The ability to make changes "on-the-fly" and without "cutting
metal" can save money and time, and will result in better designs. Online
collaboration, rapid access ...

19 <u>Interactive task planning in virtual assembly</u>
Hanqiu Sun, Bao Hujun, Tong Ngai Man, Wu Lam Fai
December 1999 **Proceedings of the ACM symposium on Virtual reality**
software and technology
Publisher: ACM Press
Full text available: <u>pdf(503.50</u>
<u>KB)</u>   Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>index terms</u>

We propose a task planner that incorporates with a virtual reality interface for 3D
immersive interaction of CAD models and high-level task planning of mating
processes. The planner is constructed with the following objectives: 3D
immersive VR interface, assembly analysis, feature/constraint update, and
assembly path planning.A virtual-assembly system has been developed based on
the modeling features and mating constraints proposed in our approach. Our
system supports a VR interf ...

20 <u>Comparative visualization of FEM-based cutting simulations in a virtual</u>
<u>environment</u>
Fritz Klocke, Andreas M. Straube
May 2003 **Proceedings of the workshop on Virtual environments 2003 EGVE**
'03
Publisher: ACM Press
Full text available: <u>pdf(86.16 KB)</u> Additional Information: <u>full citation</u>, <u>abstract</u>, <u>references</u>, <u>index terms</u>

As one of the final steps in the industrial manufacturing chain, machining
operations require significant economic consideration. At this stage, design
components have already passed through several steps of this value-added
manufacturing process. Industrial companies today are using Finite Element
Simulations to optimize manufacturing processes, such as mechanical cutting. In
order to obtain an increased understanding of the cutting process, several
simulations with different input parameters a ...

Keywords: FEM, comparative visualization, cutting simulation, virtual
environment

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